In The Claims:

Claim 1. (Currently amended) A method for forming a shallow trench isolation structure, comprising the steps of:

providing a substrate comprising at least a trench and an active region covered by a mask layer and isolated by the trench;

forming an insulation layer to fill the trenches and to cover the mask layer by high density plasma chemical vapor deposition, wherein a surface of the insulation layer is higher than a surface of the substrate and lower than a surface of the mask layer;

forming a thin film on the insulation layer;

forming a screen layer on the thin film by a fluid precursor;

removing the screen layer and the thin film over the active region at the same time, while the screen layer and the thin film above the trenches are not removed;

removing the insulation layer above the active areas to expose the mask layer, while the ~~screen layer and the~~ thin film above the trench protects the insulation layer in the trench;

removing the screen layer to expose the thin film in the trench;

removing the thin film in the trench to expose the insulation layer; and

removing the mask layer above the active region.

Claim 2. (Original) The method of claim 1, wherein the insulating layer includes a silicon oxide layer.

Claim 3. (Original) The method of claim 1, wherein the thin film includes a silicon nitride layer.

Claim 4. (Original) The method of claim 1, wherein the thin film includes a polysilicon layer.

Claim 5. (Original) The method of claim 1, wherein the screen layer includes a spin-on-glass layer.

Claim 6. (Original) The method of claim 1, wherein the screen layer includes a photoresist layer.

Claim 7. (Original) The method of claim 1, comprising further a step of forming a pad oxide layer on the substrate under the mask layer.

Claim 8. (Currently amended) A method for forming a shallow trench isolation structure, comprising:

providing a substrate comprising a plurality of trenches and a plurality of active areas, wherein the active areas are covered by a pad oxide layer and a mask layer;

forming an insulation layer in the trenches and on the mask layer, wherein the insulation layer in the trenches has a surface higher than a surface of the substrate and lower than a surface of the mask layer, and wherein the insulation layer on the mask layer has sidewalls;

forming a thin film on the insulation layer above the active areas and the trenches, wherein the thin film formed on the sidewalls of the insulation layer is thinner than the thin film formed on other positions of the insulation layer;

forming a screen layer on the thin film by a fluid precursor, wherein a thickness of the screen layer formed above the active areas is thinner than a thickness of the screen layer formed above the trenches;

removing the screen layer and the thin film above the active areas at the same time, while the screen layer and the thin film above the trenches are not removed;

removing the insulation layer above the active areas, while the ~~screen layer and the~~ thin film above the trenches protects the insulation layer in the trench;

removing the screen layer above the trenches;

removing the thin film above the trenches; and

removing the mask layer above the active areas.

Claim 9. (Original) The method of claim 8, wherein the insulating layer includes a silicon oxide layer.

Claim 10. (Original) The method of claim 8, wherein the thin film includes a silicon nitride layer.

Claim 11. (Original) The method of claim 8, wherein the thin film includes a polysilicon layer.

Claim 12. (Original) The method of claim 8, wherein the screen layer includes a spin-on-glass layer.

Claim 13. (Original) The method of claim 8, wherein the screen layer includes a photoresist layer.

Claim 14. (Currently amended) A method for forming a shallow trench isolation structure, applicable to a substrate having at least an active area on the substrate, at least a trench surrounding the active area, and a pad oxide layer and a mask layer formed sequentially on the substrate in the active area, the method comprising:

forming an insulation layer in the trenches and on the mask layer, wherein the insulation layer in the trench has a thickness ranged between a sum of a depth of the trench and a thickness of the pad oxide and a sum of the depth of the trench plus a thickness of both the mask layer and the pad oxide layer;

forming a thin layer on the insulation layer;

forming a screen layer on the thin layer above the trench;

removing the screen layer and the thin layer above the mask layer and above the active area at the same time, while the screen layer and the thin layer above the trench are not removed;

removing the insulation layer above the mask layer and above the active area, while the ~~screen layer and the~~ thin film above the trench protects the insulation layer in the trench;

removing the screen layer above the trench;

removing the thin layer above the trench; and

removing the mask layer above the active area.

Claim 15. (Original) The method of claim 14, wherein the insulating layer includes a silicon oxide layer.

Claim 16. (Original) The method of claim 14, wherein the thin layer includes a silicon nitride layer.

Claim 17. (Original) The method of claim 14, wherein the thin layer includes a polysilicon layer.

Claim 18. (Original) The method of claim 14, wherein the screen layer includes a spin-on-glass layer.

Claim 19. (Original) The method of claim 14, wherein the screen layer includes a photoresist layer.

Claim 20. (Currently amended) The method of claim 14, wherein the insulation layer is formed with a vertical sidewall by controlling an etching/deposition ratio of a high density plasma chemical vapor deposition step.